

**Technical Update**  
**Implementation of DDESB Guidance on**  
**Minimum Separation Distances for Unintentional Detonations**  
**11 September 2007**

This Technical Update supersedes all previous Technical Updates on this subject.

USACE has endorsed the use of the Hazardous Fragment Distance (HFD) for determining the Minimum Separation Distance (MSD) for unintentional detonations for Military Munitions Response Program (MMRP) responses/projects for all Munitions and Explosives of Concern (MEC).

References:

1. EM 1110-1-4009, dated June 2007, has an Errata Sheet #1 posted to it on the USACE website at: <http://www.usace.army.mil/publications/eng-manuals/em1110-1-4009/errata.pdf>
2. EP 385-1-95a, dated 27 Aug 2004, has two Errata sheets posted to it on the USACE website at: <http://www.usace.army.mil/publications/eng-pamphlets/ep385-1-95a/toc.htm>
3. DDESB Memorandum , Subject: Approval of Interim Change to DDESB Technical Paper 16, Revision 2, dated 10 September 2007

The use of the HFD for the MSD for unintentional detonations is not mandatory. The decision to use the HFD will rest with the Project Delivery Team (PDT) for the project. It is assumed that Safety will be an integral part of your PDT so you can take advantage of that discipline for planning.

The use of the HFD is not automatically engaged on existing MMRP projects. For those projects that have an approved Explosive Site Plan (ESP) or Explosives Safety Submission (ESS) or Chemical Safety Submission (CSS), and the PDT wants to use the HFD for unintentional detonations, they must submit a correction to the approved safety plan thru the existing approval channels. Corrections to ESSs/CSSs/ESPs must be approved at the Direct Reporting Unit Level (HQUSACE). The MM-CX performs that function for HQUSACE per ER 385-1-95, March 2007. The CX will forward a copy of the approved correction to USATCES for information purposes and they will forward a copy to DDESB for their files.

A Hazard Assessment will be included in all safety plans that support a response that involves the removal/investigation of UXO that wants to utilize the HFD in lieu of the maximum fragment range. This Hazard Assessment has been coordinated with USATCES and passes muster for Army Safety purposes, to satisfy the requirements of the new Chapter 15 of DOD 6055.9-STD. Since DOD has already accepted the use of the HFD for the MSD for unintentional detonations, with the Hazard Assessment, this will be a fairly painless process. USATCES will recommend approval for those safety plans based on this Hazard Assessment.

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The minimum separation distance standard of 200 feet or K50 for Team Separation Distances is replaced with the K40 distance for all MEC responses. The K40 distance is figured using the equation ( $D=40W^{1/3}$ ) for the NEW of the MGFD for the specific MRS or MRA the team is working on. K40 will also be used to determine the MSD for non-essential personnel for unintentional detonations for those MEC items that do not have a fragment producing design, blast only. The K40 distance is calculated for you on the calculation sheets printed by the Fragmentation Database application.

Dr. Michelle Crull is in the process of having all of the actual HFDs calculated for the MEC items listed in DDESB TP 18. Once this is done, all safety plans submitted will be using the actual HFD, in lieu of the minimum of 200 feet. For those MMRP projects/responses that have taken advantage of the HFD for unintentional detonations, those will be the distances used.

This is the e-mail address to download DDESB TP 16 and the Fragmentation Database. You need to remember that Dr. Crull is constantly updating and changing the TP and the Fragmentation Database, so to ensure you are using the most current calculations, you can contact Hank Hubbard at the Military Munitions Center of Expertise (MM CX) at (256) 895-1586 – e-mail: [henryhank.c.hubbard@hnd01.usace.army.mil](mailto:henryhank.c.hubbard@hnd01.usace.army.mil) , or Dr. Crull.

<https://secureweb.hqda.pentagon.mil/ddebs/>

You will not be able to access this website on anything other than a “.mil” e-mail address or DOD computer. This is a secure site and you will have to request a password from DDESB.

This is the language to be used for the Hazard Assessment, to be included in the ESS/CSS/ESP, to utilize the HFD for responses dealing with UXO in determining the Minimum Separation Distance (MSD) for non-essential personnel for unintentional detonations:

**“USACE has intrusively investigated millions of surface MEC items and subsurface anomalies that have the potential to be unexploded ordnance over the past 15 years on more than 1,000 project locations for FUDS, BRAC, and Active installations. These are extremely conservative estimates. On one project alone, USACE investigated over 3,000,000 anomalies, of which approximately 1.67% were UXO with no accidents or unintentional detonations. For these reasons, the probability of an unintentional detonation, due to project activities, is assessed to be “Extremely Low” and the use of the Hazardous Fragment Distance (HFD) for the Minimum Separation Distance (MSD) for non-essential personnel for unintentional detonations is warranted and authorized.”**



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**SEP 10 2007**

DDESB-PD

MEMORANDUM FOR U.S. ARMY DEFENSE AMMUNITION CENTER (SJMAC-ESM)  
HEADQUARTERS AIR FORCE SAFETY CENTER (SEW)  
MARINE CORPS SYSTEMS COMMAND (AM-EES)  
NAVAL ORDNANCE SAFETY AND SECURITY ACTIVITY  
(CODE N511)

SUBJECT: Approval of Interim Change to DDESB Technical Paper 16, Revision 2

References: (a) DDESB Technical Paper 16, Methodologies for Calculating Primary Fragment Characteristics, Revision 2, 17 October 2005

(b) DoD 6055.9-STD, DoD Ammunition and Explosives Safety Standards,  
5 October 2004

(c) Hazardous Fragment Distances (White Paper), Michelle Crull, PhD, PE, US  
Army Engineering and Support Center, Huntsville, 5 September 2007

Reference (a) provides a methodology for calculating the primary fragment hazards from specific munition items. Per paragraph C9.4.1.2.1. of reference (b), the methodology in reference (a) may be used to calculate munition-specific Hazardous Fragment Distances (HFDs) which may be used in lieu of default HFDs in reference (b). Per paragraph C9.8.4.2.2.2. of reference (b), calculated munition-specific Maximum Fragment Ranges (MFRs) may also be used in lieu of default MFRs in reference (b). The HFD assumes that an accidental explosion may occur and is defined as the distance at which the hazardous fragment density is no greater than  $1/600 \text{ ft}^2$ , with a hazardous fragment being defined as a fragment of 58 ft-lbs or greater. The HFD (along with other considerations such as blast and secondary debris) is used to determine separation distances for unrelated personnel in the event of an unintentional detonation. The MFR assumes there is an intentional detonation or a high likelihood that one can occur and is defined as the greatest distance to which any fragment can travel. The MFR (along with other considerations such as blast and secondary debris) is used to determine separation distances for unrelated personnel in the event of an intentional detonation. Munition-specific HFDs and MFRs, as calculated using the reference (a) methodology, are often used to determine required explosives safety distances for munitions response operations in lieu of using the default distances in reference (b).

Reference (a) requires a 200-ft minimum be applied when using the reference (a) methodology for calculating a munition-specific HFD or MFR. Per reference (c), the basis for this 200-ft minimum was to keep bystanders from interfering with or being a distraction during munitions response operations. The 200-ft minimum was not based in any way on the hazard

from an explosive item to exposed personnel. Because the 200-ft minimum has imposed an undue burden on munitions response operations and was not originally driven by explosives safety concerns, it will be removed during the next revision of reference (a).<sup>1</sup> Until that time, an interim change to reference (a) is hereby approved which removes the 200-ft minimum when using the reference (a) methodology to calculate a munition-specific HFD or MFR.

Although the 200-ft minimum was not based on hazards from the explosives to exposed personnel, it is important to recognize that interference and distraction from bystanders can pose a concern to the safe conduct of munitions response operations. Therefore, as determined by the DoD Component involved, use of larger distances than those calculated per the methodology in reference (a) is encouraged wherever feasible.

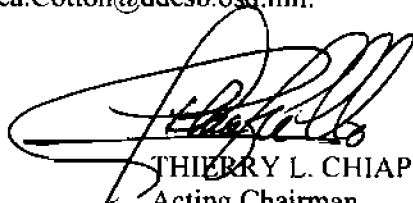
The Fragmentation Database associated with reference (a) has already been updated to remove the 200-ft minimum; the Fragmentation Database is available on the DDESB secure website. Please note that as a result of recalculating the munition-specific HFDs and MFRs for the Fragmentation Database, a previous calculation error was identified. The HFD for the M21 AT Mine has increased to 206 ft.

At Military Munitions Response Sites that already have DDESB-approved Explosives Safety Submissions, this change may be implemented without the need to submit amendments for DDESB approval. However, notification must be provided to the DDESB for inclusion in the DDESB files. For the munition item mentioned in the previous paragraph, appropriate safety distances must be increased accordingly, which may necessitate use of engineering controls (see next paragraph) to control hazards to nearby exposures.

This approval has no impact on the use of engineering controls currently approved by the DDESB to further reduce a munition-specific HFD or MFR. Such controls often involve the use of structures, sandbags, etc., which may generate secondary debris and must be reevaluated on a case-by-case basis to determine if the explosives safety distances associated with the engineering control were driven by the previous 200-ft minimum.

This approval does not change any quantity-distance criteria in reference (b).

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cc:  
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